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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Piston Rings

I, RENE EDMOND RICHARD, of 96, Boulevard Victor Hugo, Neuilly-sur-Seine, Seine, France, a citizen of France, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement: —

The present invention relates to an oil scraper piston ring for internal combustion engines, compressors, or similar machines, and has the object of providing rings of this type which are of particularly simple construction and the cost price of which is very low.

The oil scraper ring according to the invention is constructed by the combination on the one hand of at least one metal band having at least one line of apertures and folded longitudinally through said apertures, said metal band being formed into a ring having its edges situated towards the outside, and on the other hand of an expansion spring intended to bear against one face of said piston ring, another face of which is intended to bear against a side face of a piston groove in which the piston ring is to be received.

The production of a ring of this type is very inexpensive because it may be produced from a simple band of metal suitably cut out, punched, curved and rolled.

In one embodiment each metal band is rolled into the form of a complete ring, while in another embodiment it is rolled in the form of a ring segment of a length equal to a submultiple of the circumferential length of a complete ring.

In one particular embodiment, each ring or ring segment has a substantially U-shaped section having substantially parallel branches connected by an oblique base against which the expansion spring bears, the distance between the outer faces of said branches being substantially equal to the width of the piston grove which is to receive the piston ring.

In another embodiment, each ring or ring segment has a substantially W-shaped section the outer branches of which are parallel (at least when the ring is in position in the piston groove) and have their outer faces spaced apart by a length substantially equal to the width of the piston groove which is to receive the piston ring, the expansion spring being housed in the median loop of said section.

In one particular constructional arrangement the metal band has a single line of apertures constituted by transverse slots, preferably directed obliquely.

The invention will be better understood on reading the following description and with reference to the accompanying drawings in which:

Figure 1 illustrates in section a first form of construction of a scraper piston ring according to the invention, fitted in the groove in a piston.

Figure 2 shows a portion of the metal band from which the piston ring illustrated in Figure 1 is produced.

Figure 3 illustrates a portion of metal band of a different construction for the production of a W-shaped piston ring.

Figure 4 shows the section of the piston ring obtained from the band illustrated in Figure 3.

Figure 5 illustrates in section an alternative form of the piston ring illustrated in Figure 4, in the form of two rings.

Figure 6 illustrates another form of construction of the piston ring, in the form of two rings.

Figure 7 illustrates a portion of a metal band from which one of the rings of the pis-

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ton ring illustrated in Figure 6 can be manufactured.

Figure 8 illustrates an alternative to the embodiment illustrated in Figure 6.

Figure 9 illustrates in section yet another form of construction of a piston ring according to the invention, and

Figure 10 illustrates a portion of a metal band for the manufacture of the piston ring illustrated in Figure 9.

The piston ring, designated generally by 1 in Figure 1, is accommodated in an annular groove 2 in a piston 3 which slides in the bore 4 of a cylinder 5. The bottom of the piston groove 2 has oil return holes 7.

The piston ring 1 is formed from a metal band 8, a portion of which is illustrated in Figure 2. Along one of its edges this band has a line of apertures 12 produced by punching. It is then folded along a first line AB which passes through all the apertures, and along a second line CD situated near its other edge, so that the resulting section as illustrated in Figure 1, will be substantially in the form of a "U" having unequal parallel branches 15, 16 connected by an oblique base 17.

Before the piston ring is placed in position in the groove, the branches 15, 16 are preferably slightly divergent so as to bear elastically against the walls of the groove when placed in position. The dimensions of the band and the situations of its two folding lines are such that the thickness of the completed piston ring, that is to say the distance between the outer faces of the two branches of its U-shaped section will be substantially equal to the width of the annular groove 2 in the piston.

In the example illustrated, the two edges 21, 22 formed by the branches 15, 16 of the piston ring form surfaces rubbing against the wall of the cylinder 4, but one of the branches could be shorter, particularly the branch 22, so that only one of the edges of the piston ring makes rubbing contact.

The piston ring 1 as a whole is formed either by a single band folded as described above and bent in the form of a ring, or by a plurality of segments which together form the ring, the length of each segment being a submultiple of the circumferential length of the ring.

The axial pressure of the piston ring in the groove 2 is determined by the elasticity of the metal of which said piston ring is made, while the radial pressure is obtained by an expansion spring which bears against the base 17 of the U-shaped section of the piston ring, for example in the form of a coil spring 25 working by compression.

Having regard to the inclination of the base 17 of the U-shaped section of the piston ring, the expansion spring also produces an axial reaction applying the arm 15 of the piston ring against the corresponding side wall 26 of the groove 2.

In order to avoid excessive wear on the other wall 27 of the groove under the effect of the pressure applied by the spring against the latter, in this example a supporting split washer 28 has been provided which is embedded in an annular bevel 29 in the side face 27 of the groove, of a harder material than that of the piston.

The oil scraped away by the piston ring reaches the holes 7 in the piston through the apertures 12 in the piston ring.

Figure 3 illustrates a portion of another metal band 33 which along its two edges has two lines of apertures 12, 12′ respectively and, in a median part a line of rectangular apertures 34 leaving narrow cross-pieces 35 between them.

The band 33 is folded along the lines EF and GH which pass through the two lines of apertures, along two other lines IJ, KL which pass through the central apertures 35, and along its axis MN so as to form the "W" shaped section illustrated in Figure 4.

The two arms 38, 39 formed by the two end branches of the W-shaped section are parallel or slightly divergent, and the distance between their outer faces is substantially equal to the width of the piston groove in which the piston ring is to be fitted, with slight clamping which through the elasticity of the metal is sufficient to give the piston ring the desired axial pressure in the groove.

The top portions of the two branches of the median loop of the section form together an angle a which is smaller than the angle b formed by the remainder of said branches. When the piston ring is fitted, the angle a is moreover reduced by the clamping of the piston ring in the groove in the piston. The expansion spring 25 bears against the two legs of the central portion of the piston ring section. The edges of the two side arms 38, 39, form surfaces rubbing against the cylinder wall.

In order to increase the elasticity of the piston ring, the top of the median portion of the section may be thinned, for example by grinding, at the point indicated by 41 in Figure 4. Here again, the apertures 12 and 12′ serve for the passage of oil recovered by the piston ring.

In Figure 5 a modified embodiment has been illustrated which differs from that illustrated in Figure 4 by the fact that the section is formed of two separate parts the shape of which is similar to that of the single piece in the embodiment illustrated in Figure 1, said two parts together forming once again a generally W-shaped section. The piston ring illustrated in Figure 5 is therefore formed from bands of the type illustrated in Figure 2.

Figure 6 illustrates another form of construction composed of two rings produced

from bands of the type illustrated in Figure 7, which have apertures in the form of slots 46 leading into one edge of the band, the latter being curved longitudinally along two lines PQ, RS which pass through said slots; the walls of each ring are almost flat, as illustrated in Figure 6, and as an alternative construction the expansion spring 48 is constituted by a metal wire curved in the form of a star-shaped polygon which bears against the folded-over edges of tongues 47 formed by the slots 46 in the band. The oil scraped off by the pistons reaches the holes 7 in the latter through the slots 46 in the piston ring.

In the alternative embodiment illustrated in Figure 8, the section of the piston ring resembles that illustrated in Figure 6, but the two walls of each ring are practically in contact at the point indicated by 51, in order to give greater rigidity to the piston ring. The expansion spring is a compression coil spring 25.

Finally, Figure 9 illustrates another form of construction of a piston ring of W-shaped section, produced from a metal band such as 55 (Figure 10), having transverse apertures in the form of slots 56, preferably directed obliquely, so as to give a certain elasticity to the piston ring in all directions, the band being folded, similarly to the band 33 in Figure 3, along the fold lines EF, GH, IJ, KL, MN. A section which is likewise substantially W-shaped is thus obtained, the branches of which bear by their ends 58, 59 against the cylinder wall, once again under the effect of the expansion spring 25. The slots 56 also serve for the passage of the oil recovered by the piston ring.

WHAT I CLAIM IS:—

1. An oil scraper piston ring for internal combustion engines, compressors, or similar machines, characterised in that it is constituted by the combination on the one hand of at least one metal band having at least one line of apertures and folded longitudinally through said apertures, said metal band being formed into a ring having its edges situated towards the outside, and on the other hand of an expansion spring intended to bear against one face of said piston ring, another face of which is intended to bear against a side face of the piston groove in which the piston ring is to be received.

2. A piston ring according to claim 1, in which each metal band is rolled in the form of a complete ring.

3. A piston ring according to claim 1, in which each metal band is rolled in the form of a segment of a ring having a length equal to a submultiple of the circumferential length of a complete ring.

4. A piston ring according to claim 1, in which the expansion spring is a coil spring working by compression.

5. A piston ring according to claim 1, in which the expansion spring is constituted by a metal wire having a generally star-shaped polygonal configuration.

6. A piston ring according to claim 1, having a substantially U-shaped section with branches substantially parallel and connected by an oblique base against which the expansion spring bears, the distance between the outer faces of said branches being substantially equal to the width of the piston groove which is to receive the piston ring.

7. A piston ring according to claim 6, in which the metal band has a single line of apertures along the fold which gives an acute angle between a branch and the base.

8. A piston ring according to claim 1, having a substantially W-shaped section, the outer branches of which are substantially parallel and have their outer faces spaced apart from one another by a length substantially equal to the width of the piston groove which is to receive the piston ring, the expansion spring being housed in the median loop of the section.

9. A piston ring according to claim 8, in which the branches of the W-shaped section are longer than the median zone of said section.

10. A piston ring according to claim 8, in which the top part of the central loop of the section has a reduced thickness in relation to the thickness of the remainder of the section.

11. A piston ring according to claim 8, in which the two halves of the W-shaped section belong respectively to two separate parts.

12. A piston ring according to claim 8, in which the top part of the two branches of the median loop of the section form together a smaller angle than the angle formed by the remainder of said branches.

13. A piston ring according to claim 1, in which the metal band has a single line of apertures, each of which stops at a certain distance from the two longitudinal edges of the band.

14. A piston ring according to claim 13, in which the apertures are constituted by transverse slots.

15. A piston ring according to claim 14, in which the slots are directed obliquely.

16. A piston ring according to claim 8, in which the band has two lines of apertures respectively near to the edges of the two branches.

17. A piston ring according to claim 16, comprising in addition apertures in the median zone of the band.

18. A piston ring according to claim 1, in which each metal band has a single line of apertures formed by slots which lead into one edge of said band.

19. A new industrial product comprising a piston ring having, separately or in com-

bination, one or more of the characteristics according to any one of claims 1 to 18.

20. An oil scraper piston ring for internal combustion engines, compressors or similar machines substantially as herein described with reference to Figs. 1 and 2 or Figs. 3 and 4 or Fig. 5 or Figs. 6 and 7 or Fig. 8 or Figs. 9 and 10 of the accompanying drawings.

REID CLARKE & CO.,
Agents for the Applicant,
Chartered Patent Agents,
14, Red Lion Square,
London, W.C.1.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

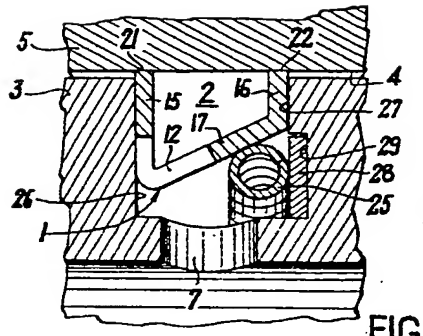

FIG.1

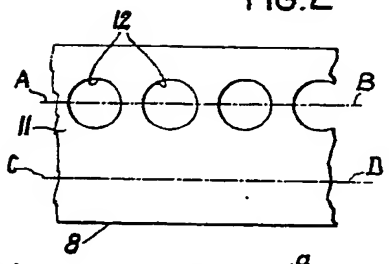

FIG.2

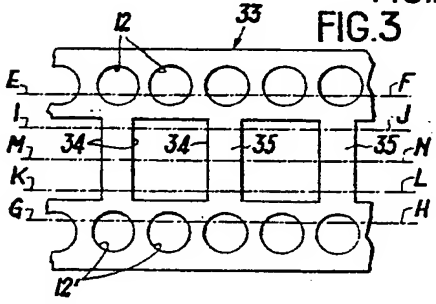

FIG.3

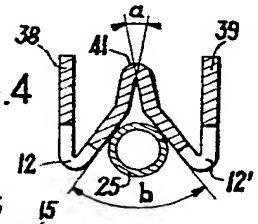

FIG.4

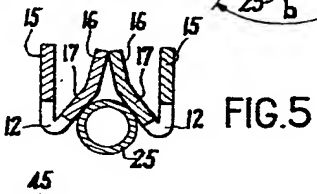

FIG.5

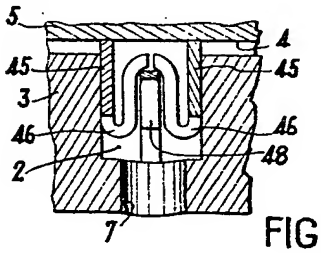

FIG.6

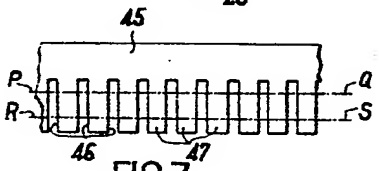

FIG.7

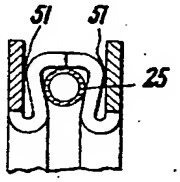

FIG.8

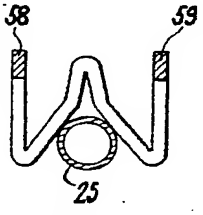

FIG.9

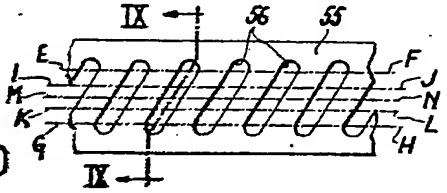

FIG.10